

**REMARKS**

Claims 1 and 3-14 are pending in this application, claims 13 and 14 having been withdrawn from consideration. By this Amendment, the specification, FIG. 4, and claims 1 and 3-12 are amended, and claim 2 is cancelled. The amendments to at least claims 4-6, 8 and 10-12 are made solely to improve the clarity of those claims. Support for the amendments to the specification and FIG. 4 can be found, for example, in the paragraphs beginning at page 1, line 13, page 1, line 28 page 2, line 32, page 11, line 4, page 13, line 24, and page 16, line 17 of the instant specification and in original FIGS. 2, 4 and 5. Support for the amendments to claims 1 and 3-12 can be found, for example, in original claims 1-12. No new matter is added. In view of the foregoing amendments and following remarks, reconsideration and allowance are respectfully requested.

**Personal Interview**

Applicants appreciate the courtesies shown to Applicants' representative by Examiner Ruggles in the March 2, 2006 personal interview. Applicants' separate record of the substance of the interview is incorporated into the following remarks.

**Objection to Drawings**

The Office Action objects to the drawings as including reference characters that are not described in the specification and failing to include reference characters that are described in the specification. By this Amendment, the specification is amended to correct errors relating to the identification of reference characters (see, e.g., paragraphs beginning at page 11, line 4, page 13, line 24, and page 16, line 17), and FIG. 4 is amended to include the reference character "B<sub>0</sub>" identifying the center plane shown with a vertical dashed line in FIG. 4. Accordingly, withdrawal of the objection is respectfully requested.

Objection to Specification

The Office Action objects to the specification as including informalities. By this Amendment, the specification is amended in accordance with the helpful suggestions in the Office Action to correct informalities. Accordingly, withdrawal of the objection is respectfully requested.

Claim Objection

The Office Action objects to claim 9 as duplicative over claim 8. Applicants respectfully traverse the objection.

Claim 9 is directed to, inter alia, selecting "the depths of the grooves" (emphasis added). Claim 8 fails to include such a feature, and thus claim 9 is not duplicative over claim 8.

Accordingly, withdrawal of the objection is respectfully requested.

Rejection Under 35 U.S.C. §112, Second Paragraph

The Office Action rejects claims 1-12 as indefinite under 35 U.S.C. §112, second paragraph. Claim 2 is cancelled, rendering the rejection moot as to that claim. As to the remaining claims, Applicants respectfully traverse the rejection.

The Office Action asserts that the meaning of the terms "apodization exposure" and "number of times of the photolithographic process in order ..." are unclear. Applicants submit that the amendments to the claims 1, 3, 7 and 9 clarify the meaning of these terms such that one of ordinary skill in the art would readily appreciate the metes and bounds of the claims.

For the foregoing reasons, claims 1-12 are definite. Accordingly, reconsideration and withdrawal of the rejection are respectfully requested.

Rejection Under 35 U.S.C. §102/§103

The Office Action rejects claims 1-12 under 35 U.S.C. §102(b), or in the alternative under 35 U.S.C. §103(a), over U.S. Patent No. 6,214,495 to Segawa et al. ("Segawa"). Claim 2 is cancelled, rendering the rejection moot as to that claim. As to the remaining claims, Applicants respectfully traverse the rejection.

Claim 1 recites "[a] phase mask ... comprising: a transparent substrate having a surface provided with a pattern of a plurality of grooves ... the plurality of grooves are arranged on the substrate in a single pitch, the duty ratios being determined by varied widths of the grooves" (emphasis added). Claim 3 recites "[a] phase mask ... comprising: a transparent substrate having one surface provided with a pattern of a plurality of grooves ... the plurality of grooves are arranged on the substrate in a single pitch ... depths of the grooves are selected so that the phase mask can be used to perform an apodization exposure" (emphasis added). Claims 7 and 9 recite methods of preparing such phase masks. Segawa does not teach or suggest such masks or methods.

The Office Action asserts that Segawa discloses a phase mask including a substrate having grooves formed with a groove pitch varying between 0.85 and 1.25  $\mu\text{m}$ . The Office Action further asserts that Segawa discloses varying a duty ratio of the grooves by varying widths and depths of the grooves according to their respective positions. Notwithstanding these assertions, Segawa does not anticipated and would not have rendered obvious the phase masks and methods of claims 1, 3, 7 and 9.

In each of claims 1, 3, 7 and 9, a phase mask includes grooves arranged on a substrate in a single pitch, or a phase mask is prepared by forming grooves on a substrate in a single pitch. In claims 1 and 7, the widths of grooves vary depending on the position of the grooves, and in claims 3 and 9, the depths of the grooves vary depending on the position of the grooves. In Segawa, by contrast, a groove pitch is varied depending on the position of the

grooves. *See* column 3, lines 1 to 5. There is no teaching or suggestion in Segawa that grooves should be arranged on a substrate in a single pitch. Also, there is no teaching or suggestion in Segawa of varying the width or depth of the grooves depending on the position of the grooves. Rather, it appears that the grooves of the phase mask of Segawa vary in pitch and are constant in width and depth.

As discussed during the March 2, 2006 personal interview, as Segawa fails to teach or suggest a phase mask or method of preparing a phase mask including a substrate having grooves formed in a single pitch, the width or depth of the grooves being varied depending on the position of the grooves, Segawa fails to teach or suggest each and every limitation of claims 1, 3, 7 and 9.

Claims 1, 3, 7 and 9 are not anticipated by and would not have been rendered obvious by Segawa. Claims 4-6, 8 and 10-12 depend variously from claims 1, 3, 7 and 9 and, thus, also are not anticipated by and would not have been rendered obvious by Segawa.

Accordingly, reconsideration and withdrawal of the rejection are respectfully requested.

Rejection Under 35 U.S.C. §103

The Office Action rejects claims 1-12 under 35 U.S.C. §103(a) over EP 936 505 to Kurihara et al. ("Kurihara") in view of U.S. Patent Application Publication No. 2002/0076154 to Maisenhoelder et al. ("Maisenhoelder"). Claim 2 is cancelled, rendering the rejection moot as to that claim. As to the remaining claims, Applicants respectfully traverse the rejection.

Claims 1, 3, 7 and 9 are set forth above. Kurihara and Maisenhoelder do not teach or suggest such phase masks or methods.

The Office Action asserts that Kurihara discloses a phase mask including a substrate having grooves formed with a groove pitch of between 0.85 and 1.25  $\mu\text{m}$ . The Office Action concedes that Kurihara does not disclose varying a duty ratio of the grooves by varying widths and depths of the grooves according to their respective positions. However, the Office

Action asserts that it would have been obvious to vary a duty ratio of the grooves by varying widths and depths of the grooves according to their respective positions in view of the teachings of Maisenhoelder. Notwithstanding these assertions, Kurihara and Maisenhoelder do not teach or suggest the phase masks and methods of claims 1, 3, 7 and 9.

As indicated above, in each of claims 1, 3, 7 and 9, a phase mask includes grooves arranged on a substrate in a single pitch, or a phase mask is prepared by forming grooves on a substrate in a single pitch. In claims 1 and 7, the widths of grooves vary depending on the position of the grooves, and in claims 3 and 9, the depths of the grooves vary depending on the position of the grooves. Kurihara provides no disclosure regarding whether the grooves of the disclosed phase mask should have a constant or varying pitch, or whether the grooves should have constant or varying widths or depths depending on position or any other parameter. Rather Kurihara merely discloses that grooves may be arranged with a pitch of between 0.85 and 1.25  $\mu\text{m}$ . *See, e.g.*, paragraph [0017].

The Office Action correctly points out that Maisenhoelder discloses that a grating adjustment can be performed by changing the groove-to-land ratio and the grating depth of a phase mask. *See* paragraph [0172]. However, Maisenhoelder, like Kurihara, does not teach or suggest (a) that either the groove-to-land ratio or the grating depth can be changed while maintaining a single pitch, or (b) that either the width or the depth of the grooves should vary depending on the position of the grooves. The only teaching or suggestion of forming grooves of a phase mask in such a manner is found in the instant specification. Of course, to rely on such teaching or suggestion would constitute impermissible hindsight.

As discussed during the March 2, 2006 personal interview, as the combination of Kurihara and Maisenhoelder fails to teach or suggest a phase mask or method of preparing a phase mask including a substrate having grooves formed in a single pitch, the width or depth

of the grooves being varying depending on the position of the grooves, the combination fails to teach or suggest each and every limitation of claims 1, 3, 7 and 9.

Claims 1, 3, 7 and 9 would not have been rendered obvious by Kurihara and Maisenhoelder. Claims 4-6, 8 and 10-12 depend variously from claims 1, 3, 7 and 9 and, thus, also would not have been rendered obvious by Kurihara and Maisenhoelder.

Accordingly, reconsideration and withdrawal of the rejection are respectfully requested.

Conclusion

In view of the foregoing, it is respectfully submitted that this application is in condition for allowance. Favorable reconsideration and prompt allowance of claims 1 and 3-14 are earnestly solicited.

Should the Examiner believe that anything further would be desirable in order to place this application in even better condition for allowance, the Examiner is invited to contact the undersigned at the telephone number set forth below.

Respectfully submitted,

  
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Attachment:  
Replacement Drawing Sheet

Date: March 8, 2006

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**Amendments to the Drawings:**

The attached replacement drawing sheet makes changes to FIG. 4 and replaces the original sheet with FIGS. 4A-4H.

Attachment: Replacement Sheet